the viewing angle is narrow and, second, contrast is low. As a method to improve the first disadvantage and to obtain the larger viewing angle, there is an alignment division. According to the alignment division, a single pixel is divided into two areas and the liquid crystal is made to arise and lie down to one direction in one area while the liquid crystal is made to arise and lie down to the other direction in the other area, thereby forming the areas with different viewing angle characteristics within a single pixel. When observed as a whole, the viewing angle characteristics are leveled and a larger viewing angle is obtained.

Please enter the following amended paragraph, which begins on page 2, line 9, of the Specification:

In order to control the alignment of the liquid crystal, rubbing is usually performed on the alignment film. When domain dividing is performed, one area of the single pixel is rubbed in a first direction by using a mask and the other area of the single pixel is rubbed in a second direction which is the opposite direction from the first direction by using a complementary mask. In another way, the whole alignment film may be rubbed in the first direction and ultraviolet irradiation is selectively performed in one area or in the other area of the single pixel by using the mask, thereby creating a difference in pre-tilt in the liquid crystal between one area and the other area.

Please enter the following amended paragraph, which begins on page 2, line 21, of the Specification:

Since the liquid crystal display using the horizontal alignment film requires rubbing, damages generated by contamination or static electricity occurring during the rubbing process is a main cause of reduction in yield.

Please enter the following amended paragraph, which begins on page 3, line 6, of the Specification:

The Japanese Patent Application No. 10-185836 by the applicant of this application proposed a liquid crystal display which can control the alignment of the liquid crystal without rubbing. This liquid crystal display is a VA mode liquid crystal display having the vertical alignment film and the liquid crystal with negative dielectric anisotropy and has a linear structure (a protrusion or a slit) arranged on each of the pair of substrates in order to control the alignment of the liquid crystal.

Please enter the following amended paragraph, which begins on page 3, line 19, of the Specification:

This MVA liquid crystal display has an advantage that rubbing is not required and, further, the domain dividing is achieved by the arrangement of the linear structure. Therefore, this MVA liquid crystal display can obtain a wide viewing angle and high

contrast. Since rubbing is not required, fabrication of the liquid crystal display is simple, the contamination to the alignment film during the rubbing process is eliminated, and reliability of the liquid crystal display is improved.

Please enter the following amended paragraph, which begins on page 3, line 28, of the Specification:

Fig. 32 is a diagram of a basic structure of the MVA liquid crystal display, showing a single pixel and its periphery. Further, throughout the diagram, items assigned the same reference numeral indicate the same thing and their repeated description is omitted.

Please enter the following amended paragraph, which begins on page 4, line 24, of the Specification:

Although not shown, on a color filter substrate (hereinafter, referred to as a CF substrate) where a color filter is formed, a protrusion 20 to control the alignment of the liquid crystal on the CF substrate side is formed and controls the alignment of the liquid crystal together with the slit 18 on the TFT substrate.

Please enter the following amended paragraph, which begins on page 4, line 30, of the Specification:

For example, when a diagonal distance of an XGA LCD (liquid crystal display) panel is equal to 15 inches, the size of a single pixel is equal to 99 μmX297 μm, the widths of the slit 18 and the protrusion 20 are equal to 10 μm each, the distance between the slit 18 and the protrusion 20 is 25 μm. Further, the width of the connecting portion 16a of the pixel electrode 16 is equal to 4 μm and the distance between an end portion of the drain bus line 12 and an end portion of the pixel electrode 16 is equal to 7 μm.

Please enter the following amended paragraph, which begins on page 5, line 11, of the Specification:

Fig. 33a shows a state of the liquid crystal when no voltage is applied between the electrodes on a pair of substrates. The pixel electrode 16 is formed on a glass electrode 24 at the TFT substrate side, and the slit 18 is formed on the pixel electrode 16. Further, an alignment film (vertical alignment film) 32 is formed covering the pixel electrode 16 and the slit 18. On the other hand, a common electrode 26 is formed on a whole surface of a glass substrate 22, facing the pixel electrode 16, and the protrusion 20 made of an insulator (a dielectric) such as photoresist is formed on the common electrode 26. Further, an alignment film (vertical alignment film) 28 is formed covering the common electrode 26 and the protrusion 20.

Please enter the following amended paragraph, which begins on page 5, line 25, of the Specification:

Furthermore, a liquid crystal layer LC is in between the TFT substrate and the CF substrate, and liquid crystal molecules (indicated by ellipses in the diagram) are aligned perpendicular to the alignment films 32 and 28. Therefore, the liquid crystal molecules are also aligned perpendicular to the alignment film 28 formed on the surface of the protrusion 20, and the liquid crystal molecules adjacent to the surface of the protrusion 20 are in an inclined state against the glass substrate 22. However, when closely observed, the liquid crystal molecules adjacent to the surface of the protrusion 20 are not aligned perpendicular to the alignment film 28, because the liquid crystal molecules are aligned substantially perpendicular to the glass substrate 22 by the alignment film 28 in the area where the protrusion 20 is not formed and due to the continuum characteristics of the liquid crystal, the liquid crystal molecules follow the liquid crystal molecules occupying a portion of the pixel and are in a state inclined from the direction perpendicular to the alignment film 28 to the direction of a normal line of the glass substrate. Also, although not shown, a pair of polarizing plates are arranged on the outside of the glass substrates 22 and 24 in the state of cross-Nicol. Therefore, in a state where no voltage is applied, the display becomes a black display.

9/0

Please enter the following amended paragraph, which begins on page 6, line 17, of the Specification:

Fig. 33b shows equipotential lines when voltage is applied between the electrodes on a pair of substrates and Fig. 33c shows the state of the liquid crystal in the case above. As shown by equipotential lines shown by dotted lines in Fig. 33b, when voltage is applied between the electrodes 16 and 26, distribution of an electric field in the portion where the slit 18 and the protrusion 20 are formed becomes different from the other portion. This is because in the portion where the slit 18 is formed, an oblique electric field is formed from the end portion of the electrode toward the opposing electrode, and in the portion where the protrusion 20 is formed, the electric field is distorted, since the protrusion 20 is a dielectric provided on the electrode 26. Therefore, as shown in Fig. 33c, the liquid crystal molecules lie toward the direction of the arrow in the diagram. In other words, the liquid molecules lie toward the direction perpendicular to the direction of the electric field depending on the magnitude of the voltage, thereby providing a white display in a state when voltage is applied. At this time, when the protrusion 20 is arranged linearly as shown in Fig. 32, the liquid crystal molecules adjacent to the protrusion 20, having the protrusion 20 as the boundary, lie to two substantially perpendicular directions to the direction where the protrusion 20 is arranged. Since the liquid crystal molecules adjacent to the protrusion 20 are slightly inclined toward the perpendicular direction to the substrate even when no voltage is applied, the liquid crystal molecules adjacent to the protrusion 20 quickly respond to the

electric field and lie down, followed by surrounding liquid crystal molecules which also lie down quickly and are influenced by the electric field. In a similar manner, when the slit 18 is provided linearly as shown in Fig. 32, the liquid crystal molecules adjacent the slit 18, having the slit 18 as a boundary, also lie to two substantially perpendicular directions to the direction where the slit 18 is arranged.

Q 11 Cont

Please enter the following amended paragraph, which begins on page 7, line 21, of the Specification:

Thus, in the area between the two alternate long and short dash lines in Fig. 33a, the liquid crystal molecules fall down to the same direction. In other words, the area aligned in the same direction if formed. This area is indicated by [A] in Fig. 32. As shown representatively by [A] through [D] in Fig. 32, since areas aligned to four different directions are formed in a single pixel, in the MVA liquid crystal display 130, characteristics of wide viewing angle can be obtained. It will be noted that alignment control can not only be performed when the slit 18 and the protrusion 20 are combined as shown in Figs. 32, 33a, 33b and 33c, but also when a protrusion or a slit and a slit, as a structure to control the alignment, are combined.

Q 12

Please enter the following amended paragraph, which begins on page 8, line 4, of the Specification:

However, although wide viewing angle can be obtained in the MVA liquid crystal display 130, an area of liquid crystal molecules that are not stable exists, and therefore, the problem of reduction in brightness exists. In other words, when voltage is applied between the electrodes, an alignment defect area 40 shown by hatching in Fig. 32 occurs. Since this alignment defect area 40 is an area where the transmisivity of the light is poor, the alignment defect area results in a reduction in brightness when the white display is performed. When viewed in the plane of Fig. 32, this alignment defect area 40 occurs on the side where the structures (protrusion of slit) provided on the CF substrate form an obtuse angle with an edge portion of the pixel electrode 16. This occurrence of the alignment defect area 40 is caused by a lateral electric field and the like generated by an influence of the drain bus line 12 at the edge portion of the pixel electrode 16. In the area where this alignment defect area 40 occurs, the liquid crystal molecules lie in the different alignment direction from the alignment direction controlled by the structures (the slit 18 and the protrusion 20 in Fig. 32) provided on a pair of substrates. In other words the alignment of the liquid crystal molecules is disturbed in this area due to the occurrence of the lateral electric field and the like, thereby resulting in a deterioration in display characteristic of the MVA liquid crystal display 130.

Please enter the following amended paragraph, which begins on page 9, line 29, of the Specification:

Fig. 35b shows a state when the auxiliary protrusion 20c is formed at the portion of the level difference of the black matrix. The auxiliary protrusion 20c is formed to cover the portion where there is the level difference. In such a state, the height d1 of the level difference is equal to approximately 0.2-1.5 μm as described above, and the height from the peak portion of the auxiliary protrusion 20c is equal to approximately 1.0-2.0 μm. The auxiliary protrusion 20c functions to rotatably align the liquid crystal molecules by easing the inclination at the portion where there is the level difference and no to concentrate the electric line of force by forming a material with low dielectric constant at the portion where there is the level difference at an angular portion. For example, a relative dielectric constant ε of the liquid crystal is approximately 6-8 and the relative dielectric constant ε of the protrusion material is approximately 3-4.

Please enter the following amended paragraph, which begins on page 11, line 25, of the Specification:

Fig. 36b shows a case when other color filter shape is applied on the CF substrate, in which a chrome shading film 34 is formed as the black matrix and the color filter is formed on the shading film 34 by pattering the color resin. In this case, the width d1 of the auxiliary protrusion 20c is also equal to approximately 10 μm and the width d2 where the auxiliary protrusion 20c and the pixel electrode 16 overlap is also designed to be

approximately 4 μm. As shown in fig. 36b, when formed according to the design value, the concentration of electric lines of force heading outwards from the display area is suppressed, the alignment of the liquid crystal molecules is stabilized and the display becomes favorable. However, at the stage when a product is actually fabricated, various irregularities during the fabrication occur, and in many cases desired characteristics are not obtained.

a15 cont

Please enter the following amended paragraph, which begins on page 14, line 25, of the Specification:

When observing this, if the design value of the overlapping width, in other words, if the design center is equal to approximately 4 μm, the irregularity in shooting occurs at a ratio of substantially 50%. The range of the values for the actual overlapping widths in this case is considered to vary from approximately 1 μm to 7 μm. If the design center is equal to approximately 6 μm, the shot irregularities are almost eliminated. The overlapping width in this case is considered to vary from approximately 3 μm to 9 μm.

a16

Please enter the following amended title, which begins on page 15, line 19, of the Specification:

a17

SUMMARY OF THE INVENTION

Please enter the following amended paragraph, which begins on page 20, line 6, of the Specification:

On a CF substrate where a color filter not shown is formed, a protrusion 20 which is to be a structure to control the alignment of the liquid crystal on the CF substrate side is provided diagonally to the pixel, and controls the alignment of the liquid crystal along with the slit 18 on the TFT substrate. The slit 18 and the protrusion 20 are placed alternately when viewed in the plane. Further, an auxiliary protrusion 20a is formed to extend out of the protrusion 20 along the end portion of the pixel electrode 16. The auxiliary protrusion 20a is formed by extending out of the protrusion 20 at a side, where the protrusion 20 and a pixel electrode 20a form an obtuse angle, at the part where the protrusion 20 intersects the pixel electrode 16 when viewed in the plane.

A18

Please enter the following amended paragraph, which begins on page 20, line 20, of the Specification:

For example, when the MVA liquid crystal display 100 is an XGA LCD panel which has a diagonal distance of 15 inches, the size of a single pixel is equal to 99 μm X 297 μm, the widths of the slit 18 and the protrusion 20 are equal to 10 μm respectively, and the distance between the slit 18 the protrusion 20 when viewed in the plane is equal to 25 μm. Further, the width of the connecting portion 16a of the pixel electrode 16 is equal to 4 μm

A19